(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 736 674 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
22.03.2000 Bulletin 2000/12

(51) Int Cl.[7]: **F01N 1/24**, F01N 1/08, F01N 7/18

(21) Application number: **96105287.5**

(22) Date of filing: **02.04.1996**

(54) Absorption member of mineral wool for acoustic insulation in an exhaust muffler, part therefor, its use, and method for producing it

Absorptionselement aus Mineralwolle für Geräuschdämpfung in einem Auspuffschalldämpfer, Bestandteil dafür, seine Verwendung und Verfahren zur Herstellung

Elément d'absorption de laine minérale pour isolation acoustique dans un silencieux d'échappement, pièce pour celui-ci, son utilisation et son procédé de fabrication

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB IT LI NL SE

(30) Priority: **03.04.1995 DE 19512438**

(43) Date of publication of application:
09.10.1996 Bulletin 1996/41

(73) Proprietor: **Grünzweig + Hartmann AG**
D-67059 Ludwigshafen (DE)

(72) Inventors:
- **Bissinger, Fridolin**
  67061 Ludwigshafen (DE)
- **Ottstadt, Dirk**
  67141 Neuhofen (DE)

(74) Representative: **Kuhnen & Wacker**
Patentanwaltsgesellschaft mbH,
Alois-Steinecker-Strasse 22
85354 Freising (DE)

(56) References cited:
EP-A- 0 353 761
DE-U- 9 012 260
DE-U- 9 401 674
US-A- 2 072 961

EP 0 736 674 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The invention concerns an absorption member made up of bound mineral wool for acoustic insulation inside an exhaust muffler, particularly of a motor car, in accordance with the preamble of claim 1, a part therefor in accordance with claim 10, as well as a method for producing it in accordance with claim 11.

[0002] Exhaust mufflers or silencers of the type provided in any automobile are often filled with mineral wool as a sound absorbing material. For this purpose, the inner pipe channelling the exhaust gas flow is perforated at its periphery to introduce the pressure pulsations of the exhaust gas flow into the sound absorbing mineral wool material. The mineral wool material is in many cases covered by a metal wool layer at the periphery of the inner pipe in order to prevent mineral fibers from being ripped loose in a considerable amount under the impact of the pulsations and emitted into the environment, whereby acoustic insulation would, of course, be impaired.

[0003] Depending on the automobile manufacturer's specifications, the exhaust pipe either simply extends rectilinearly through the muffler, or branches into a plurality of inner pipes, or widens to an inner pipe having the shape of an inner tray, or else extends along a curved axis such as to e.g. include bends covering a range of 180°. This variety of demanded shapes makes correspondingly varied demands to the properties of the acoustic insulation filling.

[0004] In the most simple case, loose wool is stuffed into the muffler. This does, however, require considerable manual labor and additional expense for quality control at the facilities of the exhaust system manufacturer. For this reason, there has been a tendency to search for possibilities of pre-fabricating the mineral wool filling as a cured shaped article on the part of the mineral wool manufacturer, which is supplied at a constant quality level and merely has to be installed at the facilities of the exhaust system manufacturer.

[0005] Such shaped articles can then be pre-fabricated in several parts, with the parts being correspondingly joined together to form the complete absorption member in the course of installation. Such a construction of the absorption members from constituent parts is required whenever the constructional peculiarities of the muffler make slipping the absorption member onto the inner pipe system in an axial direction impossible, either due to curvatures of the inner pipe, or due to webs or intermediate walls present between the inner pipe system and the muffler housing.

[0006] A particular difficulty in installing the absorption member having the form of a shaped body constituted by opposing parts results whenever the inner pipe system of the muffler is constituted of three or more inner pipes not contained in a common plane. Such a situation forms the basis for the generic prior art disclosed in DE 90 12 260 U. In such a case it is only possible by stuffing with loose wool, however not by using pre-fabricated shaped articles, to fill the internal cavity between the inner pipes entirely as must be demanded for acoustic reasons. The reason why the parts cannot encompass the inner pipes and fill the entire internal cavity without gaps resides in the fact that to this end, those portions of the parts intended to go around the rear of the inner pipes would have to be strongly compressed during installation to fit through the gap formed with adjacent pipes. This results not only in an unacceptable obstruction of installation but particularly also a destruction of the fiber structure in the portion of the cured shaped article thus compressed. Owing to accompanying permanent deformation or even severed material fragments, complete filling of the internal cavity between the inner pipes would thus not be ensured under practical conditions. Just as in the case of a shape for the parts avoiding compressions in accordance with the teaching of DE 90 12 260 U, even if the design provides for reaching around the element to be insulated, cavities having to be painstakingly stuffed with loose wool later on would thus be unavoidable.

[0007] In contrast, the invention is based on the object of furnishing an absorption member which permits complete filling of the space between the inner pipes with cured mineral wool material in the case of an assembly of parts mounted in a lateral direction, i.e. in a transverse direction with respect to the muffler axis, even in the case of a muffler having three parallel inner pipes not contained in a common plane, without having to resort to laborious subsequent stuffing work or the like.

[0008] This object is attained by the characterising features of claim 1.

[0009] Hereby it becomes possible to open the closed central passage of the part at the parting slit by bending the mineral wool material in the plane of the board, whereby the edges of the parting slit are enabled to encompass the associated inner pipe, with the edges of the parting slit resiliently returning into a position in which they close on the back of the inner pipe after reaching around the pipe periphery. It was surprisingly found that such a comparatively strong deformation is possible without any disadvantageous damage to the part. The reason herefor may be assumed to be that the deformation is distributed to all of the material at the periphery of the central passage, i.e. a concentration of the required considerable deformation path to only a small mineral wool portion is avoided. The plate-shaped design of the absorption member or of each respective part avoids local stress peaks and favors without any additional measures such a comparatively homogeneous distribution of the deformation over the periphery of the central passage. In addition, the fact that the thickness of each part is limited as a result enables easy manipulation during installation even by untrained workers, without dedicated tools being necessary and without damages having to be feared.

[0010] In a particularly preferred manner, the part is

produced of a traditional mineral fiber board which is manufactured by depositing mineral fibers provided with binding agent on a production conveyor, compressing them to the desired bulk density, and curing them in this compacted form as defined in claim 11. In the case of a traditional mineral fiber board thus produced, the great majority of fibers are arranged in planes in parallel with the plane of the production conveyor. If the part is produced by cuts perpendicular with the major surfaces of a board thus produced, then a particularly good strength of the mineral wool material at the periphery of the central passage is obtained as a result, whereby damages impairing its function during bending open the parting slit around a bending axis perpendicular with the board plane are avoided. The fiber orientation in a transversal direction with respect to the bending axis inside the board reduces the risk of local destruction of the fiber compound and ensures maintaining good resilience.

[0011] Installation of an absorption member according to the invention is furthermore facilitated by the fact that each part is slipped onto one of the inner pipes and securely remains in this position by elastically locking onto the inner pipe until the muffler is closed. This prevents parts already applied to the inner pipe system from falling off in the course of further manipulations. Assembling the entire absorption member from a multiplicity of peripherally as well as axially adjacent parts thus does not create any problems in terms of installation.

[0012] In contrast with a design as a member produced by sawing or even milling, the preferable design of the absorption members or parts as punched members makes simple and low-dust production possible.

[0013] It is already known to use board-type shaped articles comprising central passages for inner pipes as absorption members for exhaust mufflers. In such cases, however, the central passages are closed at the periphery thereof, and the board-type shaped article is slipped onto the inner pipe system in an axial direction in the manner of spectacles. Introducing a parting slit between central passage and outer contour or any other deformation in the course of mounting is not provided.

[0014] In the case of a great material thickness between that side of the central passage located opposite the parting slit and the adjacent outside of the part, such that only a minute deformation takes place in this location owing to very high strength while the parting slit is bent open, then in accordance with claim 2 deformability in this location may selectively be assisted by a stress-reducing slit in the peripheral wall of the central passage located opposite the parting slit. The depth of the stress-reducing slit also determines the extent in which the material located on the side opposite the parting slit becomes involved in the deformation to thus selectively reduce the required deformation path along the remaining peripheral edges of the central passage.

[0015] Shaped articles wherein the mineral wool provided with yet uncured binding agent is brought into the desired three-dimensional shape and cured in this shape typically present binding agent contents of distinctly more than 2 % wt. dry. Thus even exposed locations of the shaped article can be given sufficient strength. In accordance with claim 3, an absorption member of the invention is, however, produced to have a binding agent content of less than 2 % wt. dry or lower, as is also common in manufacturing mineral wool boards for construction purposes or the like. Owing to the board shape or, in the preferred case, by manufacturing the absorption member from a traditional board, stress peaks at exposed locations are avoided with respect to the rather two-dimensional shape, permitting working with lower contents of binding agent.

[0016] In the case of a shorter axial length of the muffler or of one of the chambers thereof to be filled with mineral wool material, complete filling with a board-shaped absorption member undivided in the axial direction is viable. In view of the board-shaped design of the absorption member it is, however, also readily possible to assemble the absorption member in accordance with claim 4 from a plurality of board-type shaped sections arranged in juxtaposition. Owing to the locking attachment of the sections to the associated inner pipe, assembly from a plurality of sections equally does not present any problems in terms of installation.

[0017] Using board-type shaped sections having limited thicknesses, in accordance with claim 5, particularly having thicknesses of less than 10 cm, preferably less than 8 cm and particularly less than 6 cm, on the one hand permits simple handling during installation by bending open at the parting slit, and on the other hand permits producing the sections by punching which is preferred over ways of processing whereby chips or particles would be released.

[0018] In the case of three inner pipes, two parts are preferably formed in accordance with claim 6, the dividing line of which passes between two inner pipes. In this manner, each part is associated with an inner pipe to which it can be attached by snapping on.

[0019] In accordance with claim 7, the dividing line intersects the third inner pipe, preferably in the axis thereof. Hereby it is possible to simply apply the parts to the periphery of the third inner pipe in the absence of any undercutting.

[0020] In a particularly preferred embodiment of the invention, the parts are in accordance with claim 8 prefabricated to cohere to each other while being delimited from each other by a dividing line. In this manner it is ensured that the respective correct and fitting parts are available at the time of installation without the risk of mistakes and can safely be installed free of errors. If, in accordance with claim 9, the dividing line is formed by a non-continuous punched cut in the manner of a perforation, the cohering parts can be snapped apart in a single motion and installed separately without increased production expenses being necessary.

[0021] As an alternative, the parts may, however, also be manufactured separately and supplied as independ-

ently marketable products as claimed in accordance with claim 10.

[0022] Such parts may be used according to the invention to form absorption members for mufflers including at least three inner pipes which are not comprised in a common plane.

[0023] Further details, features and advantages of the invention will become apparent from the following description of embodiments by referring to the appended drawings, wherein:

Fig. 1 is a perspective explosion view of a muffler comprising absorption members according to the invention which are made up of parts, extend in a first example over the entire width of the installation space, and are comprised in a second example of a plurality of board sections arranged in juxtaposition;

Fig. 2 is a perspective view of an absorption member of the invention or a board section thereof, respectively;

Fig. 3 shows a part of the absorption member of Fig. 2;

Fig. 4 shows the part of Fig. 3 in a position deformed for installation prior to mounting on the muffler;

Fig. 5 is a schematic view of the method for producing an absorption member or part thereof, respectively, of the invention; and

Fig. 6 is a schematic partial view of a punching tool for producing a non-continuous cut.

[0024] Fig. 1 shows an example of a muffler 2 to be insulated by means of absorption members according to the invention. The muffler 2 comprises a muffler housing 4 in turn comprised of peripheral wall portions 6 and 8 which are welded or crimped together at their edges such as to form a peripherally closed housing shell, and of associated front wall portions 10 and 12 including an exhaust gas inlet pipe 14 and an exhaust gas outlet pipe 16, respectively. Exhaust gas from a combustion engine not shown here, particularly from the engine of a motor car, is conveyed to the space enclosed by the peripheral wall constituted by peripheral wall portions 6 and 8 via the exhaust gas inlet pipe 14 and again discharged from muffler 2 by means of the exhaust gas outlet pipe 16 on the opposite side.

[0025] Inside the inner cavity of the muffler housing 4, an inner pipe assembly comprehensively shown under 18 is provided, which in an exemplary case is constituted of three inner pipes 20, 22 and 24 in parallel arrangement which are secured in their respective positions by means of three intermediate walls 26, 28 and 30 inside the inner cavity of the muffler housing 4. The outer circumference of intermediate walls 26, 28 and 30 has a contour conforming with the periphery of the muffler housing 4, such that the intermediate walls 26, 28 and 30 subdivide the inner cavity of the muffler housing 4 into chambers 32, 34, 36 and 38 which are peripherally insulated with respect to each other.

[0026] The exhaust gas is initially introduced by the exhaust gas inlet pipe 14 of the front wall portions 10 into the inner pipe 24, which is peripherally closed in the range of chamber 32 (hidden from view in the drawing) and provided with a peripheral perforation 25 in the range of chambers 34 and 36. Through the perforation 25 the exhaust gas enters into chambers 34 and 36 acting as absorption chambers in a generally known manner in interaction with absorption members 40 and 42 to thereby lose part of its sound or pulsation energy. The exhaust gas passes from the inner pipe 24 into the chamber 38 positioned opposite the entry side and formed as a reflection chamber. Hereby a further part of the sound energy is annihilated as a result of reflection phenomena. From the reflection chamber 38, the exhaust gas then enters into the inner pipe 22 provided at its outer periphery with a perforation 23 wherethrough in turn sound energy is annihilated inside absorption chambers 34 and 36. From the inner pipe 22 the exhaust gas then enters into reflection chamber 32 located opposite reflection chamber 38, where sound energy is again annihilated by reflection. From the reflection chamber 32 the exhaust gas flow finally enters into the inner pipe 20 entirely closed at its periphery, which is extended downstream along the last intermediate wall 26 and merges into the exhaust gas outlet pipe 16 of the muffler housing 4.

[0027] The absorption chambers 34 and 36 are filled up with the respective absorption members 40 and 42 made up of bound mineral wool which consequently have to receive the inner pipe assembly 18 in the area of absorption chambers 34 and 36. The outer contour of absorption members 40 and 42 conforms with the contour of the muffler housing 4, with inner pipes 20, 22 and 24 being received in associated recesses 44, 46 and 48 of respective absorption members 40 and 42. In order to protect the mineral wool against the powerful pressure pulsations and in order to improve the ejection behavior, a mechanically resistant, however acoustically permissive protection layer e.g. comprised of metal wool may be arranged in a generally known manner at the inner periphery of recesses 46 and 48. In the range of the recesses 44 this is not necessary in the present example as they receive the non-perforated inner pipe 20 and are therefore not exposed to stresses by the exhaust gas flowing inside inner pipe 20.

[0028] In the present example, the very arrangement of intermediate walls 26, 28 and 30 precludes axial slipping on of absorption members 40 and 42. Installation on the inner pipe assembly 18 in a lateral direction, i.e. in a radial direction instead of axially, is therefore nec-

essary.

[0029] For the purpose of installation, absorption members 40 and 42 are constituted of respective parts 40a and 40b or 42a and 42b abutting in the installed position at their dividing lines or cut surfaces 50. The recess 44 for the inner pipe 20 is centrally divided by the dividing line or cut surface 50, resulting in two semicircular depressions respectively associated with parts 40a and 40b or 42a and 42b which encompass the inner pipe 20 from two sides. The recesses 46 and 48 in turn are designed as peripherally closed central passages receiving the inner pipes 22 and 24 entirely inside each respective part 40a and 40b or 42a and 42b. In order to enable the installation process which is described in more detail below, the recesses 46 and 48 are provided with a respective parting slit 47 or 49 extending towards the outside of respective associated parts 40a and 40b or 42a and 42b, through which the respective inner pipes 22 and 24 can pass when installing the respective parts 40a and 40b or 42a and 42b.

[0030] The parts 40a and 40b as well as 42a and 42b, i.e. the absorption members 40 and 42 include parallel major surfaces 52 in a perpendicular direction with respect to the cut surfaces and thus basically have a board-type shape. In order to enable the advantageous production from a mineral wool board by punching made possible thereby, as will be explained in further detail herebelow, the board thickness, i.e. the width of absorption members 40 and 42 is limited. If an installation space inside an absorption chamber 34 or 36 having a width in excess of 6 to 10 cm is to be filled up by absorption bodies 40 or 42, it is advantageous to build up the single absorption members of board-type shaped sections 41 having a small width of 4 cm in the present example, as is depicted for absorption member 40 and parts 40a and 40b, respectively. By means of such multiple arrangement of board-type shaped sections 41, any desired structural width can be achieved without the mineral wool board used for producing absorption members 40 and 42 having to present an undesirably great thickness.

[0031] In Fig. 2, the absorption member 40 or a board-type shaped section 41 thereof, respectively, is represented in further detail. In the shown manner, each absorption member 40 or board-type shaped section 41 thereof, respectively, is pre-fabricated in the case of the depicted example to have the entire contour of absorption member 40, and the outer contour can be produced by punch-cutting. In the same manner, the recess 44 for the non-perforated inner pipe 20, which is made up of semicircular depressions of the single parts 40a and 40b, is produced by means of corresponding punching tools. The peripherally closed central passages inside each part 40a and 40b formed as recesses 46 and 48 together with parting slits 49 and cut surface or dividing line 50 are equally produced in a single work step by means of a corresponding punching tool. The dividing line 50 comprises a portion 51 wherein only a non-continuous punched cut has been produced, such that the parts 40a and 40b following their production initially remain connected to each other. Only during installation, the two material webs represented under 51a are manually destroyed in the range of portion 51 of the dividing line or cut surface 50 by bending open the dividing line 50 between parts 40a and 40b, resulting in separate parts 40a and 40b as represented in Fig. 1.

[0032] In this manner part 40a, a view of which is again represented in Fig. 3, is obtained. The installation of part 40a is shown in detail in Fig. 4. At the parting slit 49, the material is bent open at the periphery of recess 46. This results in a deformation distributed more or less homogeneously over the entire peripheral range of recess 46 and thus including the entire material in this location in the absence of excessive stress peaks. In this manner, the deformation succeeds despite the relatively great deformation path in the absence of any excessive stress peaks and thus largely of any destruction to the structure of the bound mineral wool, such that the edges of parting slit 49 resiliently return after the part 40a has been installed on the inner pipe 22 in the representation of Fig. 4 and present a final installed position which would be identical if the part 40a could have been installed by slipping onto the inner pipe 22. The board-shaped character of board sections 41 or absorption members 40 and 42, respectively, which avoids irregularities of shape with unavoidable stress peaks, also contributes to avoiding stress peaks which would substantially impair the material structure. This is also supported by the design of the absorption member as a punched member from a traditional mineral fiber board as in this case, the fibers of the mineral wool are oriented substantially in a transverse direction with respect to the bending axis, i.e. the axis of recess 46, and thus have good resistance against the formation of gaping fissures in the material structure.

[0033] Fig. 5 schematically shows production of absorption members 40 and 42 or of respective board-type shaped sections 41 herefor. A conventional fiberising unit not shown here, such as e.g. a fiberising rotor, in cooperation with suitable gas flows generates a gas flow 202 which comprises cooling fibers and is channelled into a chute 204 where the fibers are sprayed with binding agent through nozzles 206. The fibers thus provided with uncured binding agent arrive at the bottom of chute 204 on a production conveyor 208 on which they are deposited under low pressure and form a mat 212 as they approach the exit 210 from the chute 204. Owing to the described manner of fiber deposition, a large proportion of the fibers is arranged inside planes in parallel with the production conveyor 208 while having a largely random orientation within the orientation in this plane. Only a relatively small proportion of the fibers is arranged in the thickness direction of mat 212.

[0034] Compression of mat 212 to the desired final thickness and concurrent curing of the binding agent takes place inside a tunnel furnace 214, such that the

material exits from the tunnel furnace 214 having the form of a continuous board 216 with a desired height and bulk density. The continuous board 216 is then supplied to a punching device 218 wherein punching tools 220 in a manner known per se produce e.g. the board section 41 shown in Fig. 2 or, if the installation space has a small width, an entire absorption member 40 including all the cuts with a perpendicular orientation with respect to the major surfaces 52.

[0035] As is shown in more detail in Fig. 6 in this respect, the used punching tool 220 is provided in the area of portion 51 of the cut surface 50 including gaps 222, such that corresponding material webs 51a connecting the parts 40a and 40b remain between the cut surfaces until the time of installation. It is thereby ensured that mistakes do not occur during installation and that the respective parts are always ready at hand when they are required for installation.

Claims

1. Absorption member (40, 42) made up of bound mineral wool

   for acoustic insulation inside an exhaust muffler (2), particularly of a motor car, which includes at least three inner pipes (20, 22, 24) arranged in parallel with each other and not included in a common plane,

   having an outer contour which matches the periphery of the muffler housing (4) and

   having recesses (44, 46, 48) which correspond to the inner pipes (20, 22, 24) to be received,

   and said absorption member being constituted of parts (40a, 40b, 42a, 42b) which can be installed on said inner pipes (20, 22, 24) in a lateral direction such as to jointly form the absorption member (40, 42) receiving said inner pipes (20, 22, 24) in said recesses,

   characterised

   by being formed as a board-type shaped article, particularly a punched member with parallel major surfaces (52),

   by formation of at least one of said recesses (46, 48) in at least one of said parts (40a, 40b, 42a, 42b) as a central passage at least approximately entirely closed and having a contour adapted to the periphery of an associated inner pipe (22, 24), and

   by a parting slit (47, 49) extending in the material of said part from said at least one recess (46, 48) formed as a central passage as far as the outside of said part (40a, 40b, 42a, 42b).

2. Absorption member in accordance with claim 1, characterised in that the edge of said central passage includes a stress-reducing slit on its side opposite said parting slit (47, 49).

3. Absorption member in accordance with claim 1 or 2, characterised by a binding agent content of 2% wt. dry or less.

4. Absorption member in accordance with any one of claims 1 to 3, characterised by being assembled of a plurality of board-type shaped sections (41) arranged in juxtaposition.

5. Absorption member in accordance with claim 4, characterised in that each of said board-type shaped sections (41) has a thickness of less than 10 cm, preferably less than 8 cm, and particularly less than 6 cm.

6. Absorption member in accordance with any one of claims 1 to 5, characterised in that in the case of three inner pipes (20, 22, 24), two parts (40a, 40b and 42a, 42b) having a dividing line (50) which passes between two inner pipes (22, 24) are formed.

7. Absorption member in accordance with claim 6, characterised in that said dividing line (50) intersects said third inner pipe (20) preferably in the axis thereof.

8. Absorption member in accordance with any one of claims 1 to 7, characterised in that said parts (40a, 40b and 42a, 42b) are pre-fabricated to cohere to each other while being delimited from each other by a dividing line (50).

9. Absorption member in accordance with claim 8, characterised in that at least one portion (50 or 51) of said dividing line is formed by a non-continuous, perforation-type punched cut.

10. A part (40a, 40b, 42a, 42b) for the absorption member (40,42) as defined in claim 1, said part having at least one recess (46, 48) as a central passage at least approximately entirely closed and having a contour adapted to the periphery of an associated inner pipe (22, 24), and said part also having a parting slit (47, 49) extending in the material of said part from said recess (46, 48) formed as a central passage as far as the outside of said part (40a, 40b, 42a, 42b).

11. Method for producing an absorption member (40, 42) in accordance with claim 1 or a part (40a, 40b, 42a, 42b) thereof in accordance with claim 10, respectively,
characterised by the steps of

depositing mineral fibers (202) provided with binding agent on a production conveyor (208) and subsequently compacting and curing the resulting fiber mat (212) to produce a mineral wool board (216),

and punching from said mineral wool board (216) said absorption members (40, 42) or parts (40a, 40b, 42a, 42b) thereof, respectively, including said recesses (44, 46, 48) and slits (47, 49).

12. Method in accordance with claim 11, characterised in that in the area of said dividing line (50) between parts (40a, 40b and 42a, 42b) pertaining to an absorption member (40, 42), a non-continuous punching tool (220) is used to produce a perforated portion (51).

Patentansprüche

1. Absorptionsteil (40, 42) aus gebundener Mineralwolle

zur Schalldämpfung in einem Abgasschalldämpfer (2), insbesondere eines Personenkraftwagens, mit mindestens drei parallel zueinander verlaufenden und nicht in einer gemeinsamen Ebene liegenden Innenrohren (20, 22, 24),

mit einer dem Umfang des Schalldämpfergehäuses (4) entsprechenden Außenkontur und

mit den aufzunehmenden Innenrohren (20, 22, 24) entsprechenden Ausnehmungen (44, 46, 48),

sowie mit einem Aufbau des Absorptionsteils aus Teilstücken (40a, 40b, 42a, 42b), die von der Seite her so an den Innenrohren (20, 22, 24) montierbar sind, daß sie gemeinsam das die Innenrohre (20, 22, 24) in den Ausnehmungen aufnehmende Absorptionsteil (40, 42) ergeben,

gekennzeichnet

durch seine Ausbildung als plattenförmiges Formteil, insbesondere Stanzteil, mit zueinander parallelen Großflächen (52),

durch Ausbildung wenigstens einer der Ausnehmungen (46, 48) in wenigstens einem der Teilstücke (40a, 40b, 42a, 42b) als umfangsseitig wenigstens annähernd vollständig geschlossener zentraler Durchgang mit einer dem Umfang eines zugeordneten Innenrohres (22, 24) angepaßten Kontur, und

durch einen von der als zentraler Durchgang ausgebildeten Ausnehmung (46, 48) zur Außenseite des Teilstücks (40a, 40b, 42a, 42b) verlaufenden Trennschlitz (47, 49) im Material des Teilstücks.

2. Absorptionsteil nach Anspruch 1, dadurch gekennzeichnet, daß der Rand des zentralen Durchgangs an der dem Trennschlitz (47, 49) gegenüberliegenden Seite einen Dehnschlitz aufweist.

3. Absorptionsteil nach Anspruch 1 oder 2, gekennzeichnet durch einen Bindemittelgehalt von 2 Trokken-Gew.-% oder weniger.

4. Absorptionsteil nach einem der Ansprüche 1 bis 3, gekennzeichnet durch seinen Aufbau aus einer Mehrzahl Seite an Seite angeordneter plattenförmiger Formabschnitte (41).

5. Absorptionsteil nach Anspruch 4, dadurch gekennzeichnet, daß jeder der plattenförmigen Formabschnitte (41) eine Dicke von weniger als 10 cm, vorzugsweise weniger als 8 cm, und insbesondere weniger als 6 cm aufweist.

6. Absorptionsteil nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß im Falle dreier Innenrohre (20, 22, 24) zwei Teilstücke (40a, 40b bzw. 42a, 42b) gebildet sind, deren Trennlinie (50) zwischen zwei Innenrohren (22, 24) hindurchläuft.

7. Absorptionsteil nach Anspruch 6, dadurch gekennzeichnet, daß die Trennlinie (50) das dritte Innenrohr (20) vorzugsweise in seiner Achse schneidet.

8. Absorptionsteil nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß die Teilstücke (40a, 40b bzw. 42a, 42b) zusammenhängend vorgefertigt und durch eine Trennlinie (50) voneinander abgegrenzt sind.

9. Absorptionsteil nach Anspruch 8, dadurch gekennzeichnet, daß wenigstens ein Abschnitt (50 oder 51) der Trennlinie durch einen nach Art einer Perforation unterbrochenen Stanzschnitt gebildet ist.

10. Teilstück (40a, 40b, 42a, 42b) für das Absorptionsteil (40, 42) nach Anspruch 1, wobei das Teilstück wenigstens eine Ausnehmung (46, 48) als wenig-

stens annähernd vollständig geschlossener zentraler Durchgang mit einer dem Umfang eines zugeordneten Innenrohres (22, 24) angepaßten Kontur aufweist, und wobei das Teilstück ferner einen von der als zentraler Durchgang ausgebildeten Ausnehmung (46, 48) zur Außenseite des Teilstücks (40a, 40b, 42a, 42b) verlaufenden Trennschlitz (47, 49) im Material des Teilstücks aufweist.

11. Verfahren zur Herstellung eines Absorptionsteils (40, 42) nach Anspruch 1 bzw. eines Teilstücks (40a, 40b, 42a, 42b) nach Anspruch 10, gekennzeichnet durch die Schritte

Ablage von mit Bindemittel versehenen Mineralfasern (202) auf einem Produktionsband (208) und nachfolgende Verdichtung und Aushärtung des so gebildeten Faservlieses (212), um eine Mineralwolleplatte (216) zu erzeugen, und

Herausstanzen der Absorptionsteile (40, 42) bzw. der Teilstücke (40a, 40b, 42a, 42b) einschließlich der Ausnehmungen (44, 46, 48) und der Schlitze (47, 49) aus der Mineralfaserplatte (216).

12. Verfahren nach Anspruch 11, dadurch gekennzeichnet, daß ein unterbrochenes Stanzmesser (220) zur Erzeugung eines Perforations-Abschnittes (51) im Bereich der Trennlinie (50) zwischen zu einem Absorptionsteil (40, 42) gehörenden Teilstücken (40a, 40b bzw. 42a, 42b) verwendet wird.

Revendications

1. Elément d'absorption (40, 42) constitué de laine minérale liée,

pour isolation acoustique à l'intérieur d'un silencieux d'échappement (2), en particulier d'une automobile, qui comporte au moins trois tuyaux intérieurs (20, 22, 24) agencés en parallèle les uns aux autres et qui ne sont pas inclus dans un plan commun,
ayant un contour extérieur qui correspond à la périphérie de l'enveloppe (4) du silencieux, et ayant des cavités (44, 46, 48) qui correspondent aux tuyaux intérieurs (20, 22, 24) à recevoir,
et ledit élément d'absorption étant constitué de parties (40a, 40b, 42a, 42b) qui peuvent être installées sur lesdits tuyaux intérieurs (20, 22, 24) dans une direction latérale de manière à former conjointement l'élément d'absorption (40, 42) recevant lesdits tuyaux intérieurs (20, 22, 24) dans lesdites cavités,
caractérisé

par le fait d'être formé en tant qu'article ayant une forme du type planche, en particulier un élément poinçonné ayant des surfaces principales parallèles (52),
par la formation d'au moins une desdites cavités (46, 48) dans au moins une desdites parties (40a, 40b, 42a, 42b) en tant que passage central au moins approximativement entièrement fermé ayant un contour adapté à la périphérie d'un tuyau intérieur associé (22, 24), et
par une fente de séparation (47, 49) s'étendant dans le matériau de ladite partie depuis ladite au moins une cavité (46, 48) formée en tant que passage central jusqu'à l'extérieur de ladite partie (40a, 40b, 42a, 42b).

2. Elément d'absorption selon la revendication 1, caractérisé en ce que le bord dudit passage central comporte une fente de réduction de contrainte sur son côté opposé à ladite fente de séparation (47, 49).

3. Elément d'absorption selon la revendication 1 ou 2, caractérisé par une teneur en agent de liaison de 2 % en poids de matière sèche ou moins.

4. Elément d'absorption selon l'une quelconque des revendications 1 à 3, caractérisé en ce qu'il est assemblé à partir d'une pluralité de tronçons ayant une forme du type planche (41) agencés en juxtaposition.

5. Elément d'absorption selon la revendication 4, caractérisé en ce que chacun desdits tronçons ayant une forme du type planche (41) a une épaisseur inférieure à 10 cm, de préférence inférieure à 8 cm, et en particulier inférieure à 6 cm.

6. Elément d'absorption selon l'une quelconque des revendications 1 à 5, caractérisé en ce que, dans le cas de trois tuyaux intérieurs (20, 22, 24), deux parties (40a, 40b et 42a, 42b) sont formées ayant une ligne séparatrice (50) qui passe entre deux tuyaux intérieurs (22, 24).

7. Elément d'absorption selon la revendication 6, caractérisé en ce que ladite ligne séparatrice (50) coupe ledit troisième tuyau intérieur (20) de préférence dans son axe.

8. Elément d'absorption selon l'une quelconque des revendications 1 à 7, caractérisé en ce que lesdites parties (40a, 40b et 42a, 42b) sont préfabriquées pour s'assembler l'une à l'autre tout en étant délimitées l'une de l'autre par une ligne séparatrice (50).

9. Elément d'absorption selon la revendication 8, caractérisé en ce qu'au moins une partie (50 ou 51) de ladite ligne séparatrice est formée par une découpe poinçonnée non-continue du type perforation.

10. Partie (40a, 40b, 42a, 42b) pour l'élément d'absorption (40, 42) selon la revendication 1, ladite partie ayant au moins une cavité (46, 48) en tant que passage central au moins partiellement entièrement fermé et ayant un contour adapté à la périphérie d'un tuyau intérieur associé (22, 24), et ladite partie ayant également une fente de séparation (47, 49) s'étendant dans le matériau de ladite partie depuis ladite cavité (46, 48) formé en tant que passage central jusqu'à l'extérieur de ladite partie (40a, 40b, 42a, 42b).

11. Procédé de production d'un élément d'absorption (40, 42) selon la revendication 1 ou d'une partie (40a, 40b, 42a, 42b) de celui-ci selon la revendication 10, respectivement,
caractérisé par les étapes consistant à

déposer des fibres minérales (202) munies d'un agent de liaison sur un convoyeur de production (208) et compacter et faire durcir par la suite le matelas de fibres résultant (212) pour produire une planche de laine minérale (216), et poinçonner à partir de ladite planche de laine minérale (216) lesdits éléments d'absorption (40, 42) ou parties (40a, 40b, 42a, 42b) de ceux-ci, respectivement, incluant lesdites cavités (44, 46, 48) et fentes (47, 49).

12. Procédé selon la revendication 11, caractérisé en ce que dans la zone constituée de ladite ligne séparatrice (50) entre des parties (40a, 40b, 42a, 42b) appartenant à un élément d'absorption (40, 42), un outil de poinçonnage non-continu (220) est utilisé pour produire une partie perforée (51).

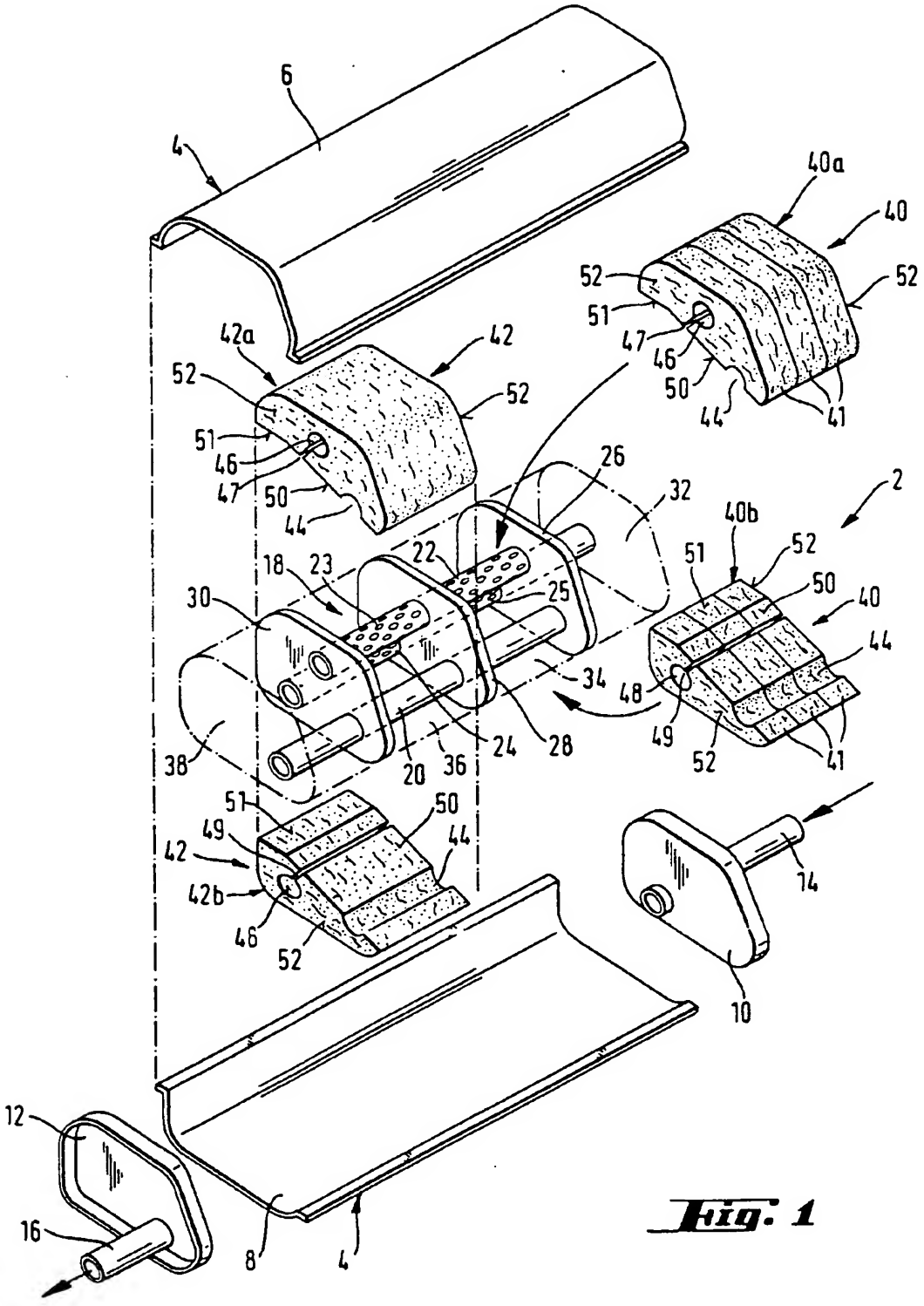
6
4
40a
40
52
51
47
46
50
44
41
42a
42
26
32
2
40b
18
23
22
25
30
34
48
49
38
20
36
24
28
42
42b
14
10
12
16
8

Fig. 1

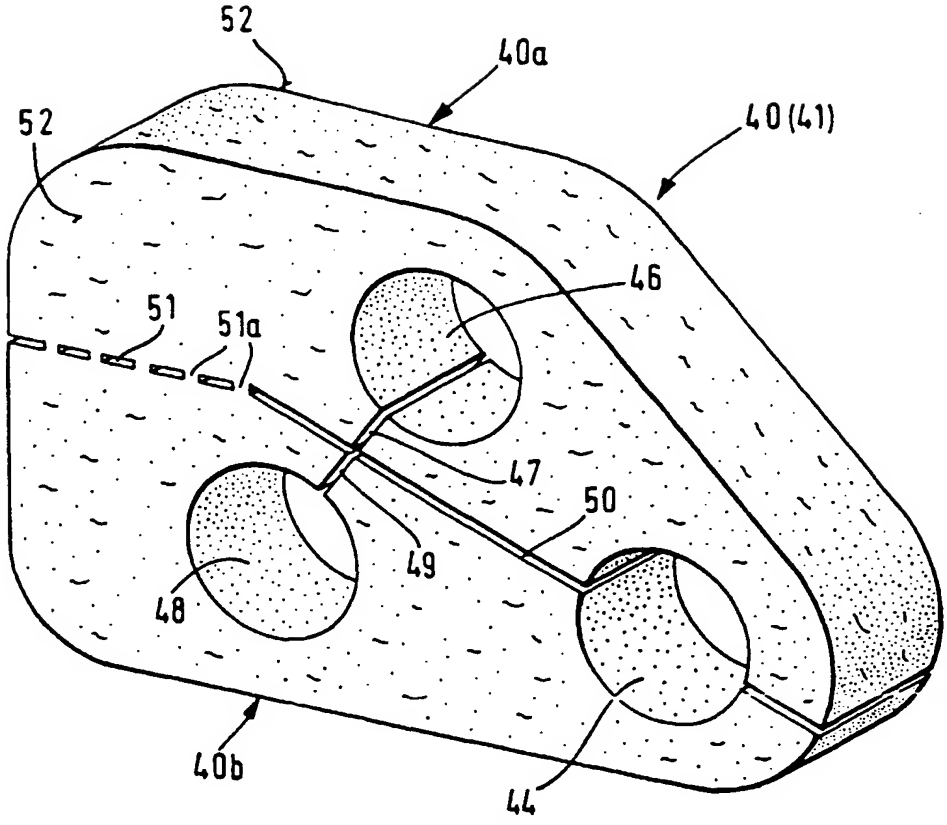

Fig. 2

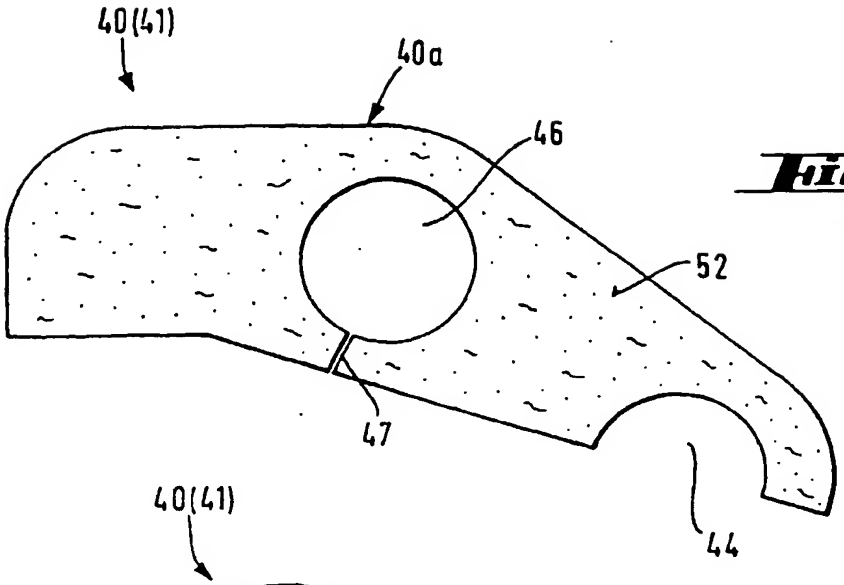

Fig. 3

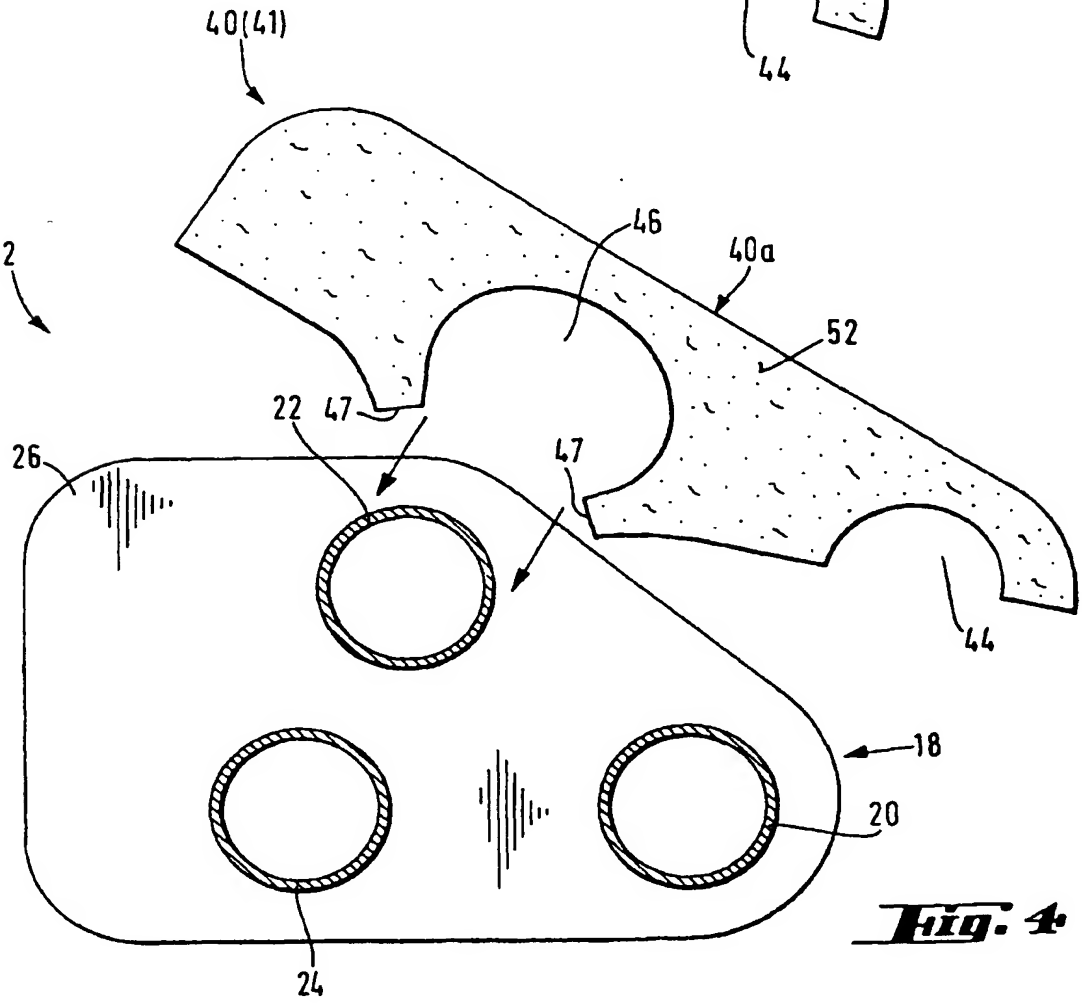

Fig. 4

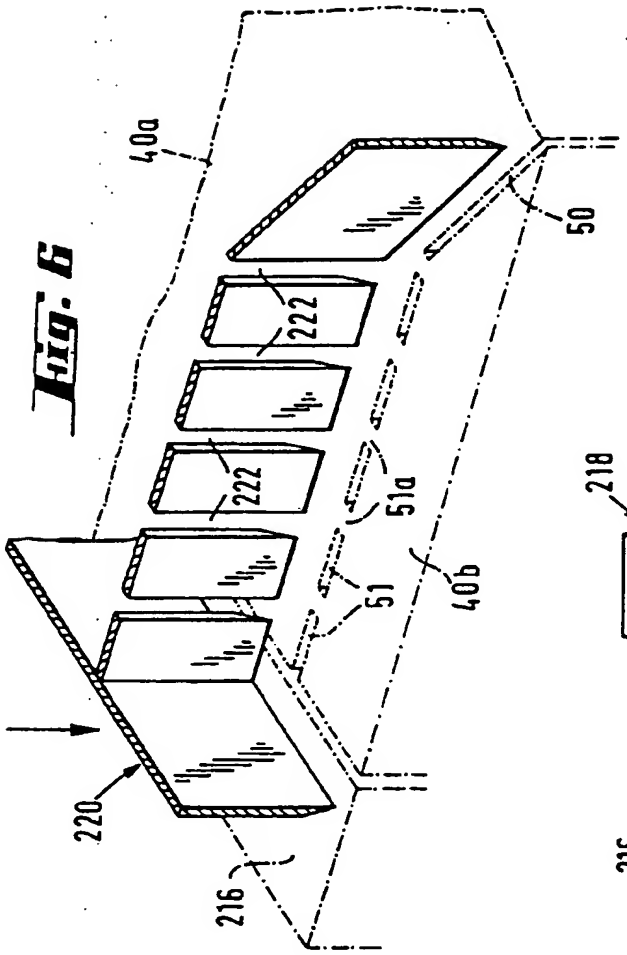
40a
50
222
222
51a
51
40b
220
216

Fig. 6

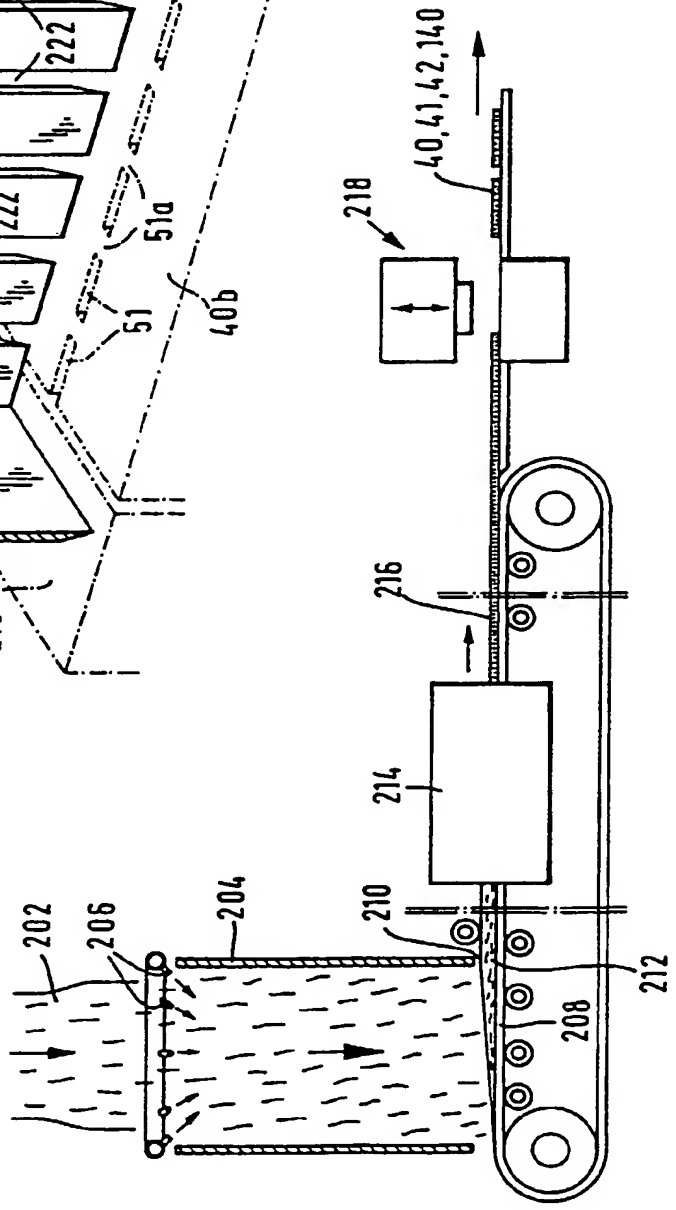
40,41,42,140
218
216
214
202
206
204
210
212
208

Fig. 5